THE CHIRPED-PULSE CLUB: MICROWAVE SPECTROSCOPY RESEARCH IN HIGH SCHOOL

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A new course offering a research experience in microwave spectroscopy to high school students has been developed at the South Carolina Governor's School for Science and Mathematics. Seven students working in small groups completed research projects in microwave spectroscopy during the fall semester of 2020. The students measured the spectra of previously unstudied chemicals, performed relevant *ab initio* calculations, analyzed the spectra to find the rotational and distortion constants, and prepared presentations for the school's Annual Research Colloquium. Chemicals studied include 2-fluorobenzotrifluoride, trans-2-pentenal, and 2,6-difluorophenol. The spectra were measured on a 8 - 18 GHz chirped-pulse Fourier transform microwave (CP-FTMW) spectrometer. The spectrometer employs an Analog Devices AD-9914 direct digital synthesizer to generate a chirped pulse with a bandwidth of 1 GHz. The chirped pulse is mixed with a tunable carrier frequency and the spectrum is measured in 2 GHz (the output of the mixer includes the lower and upper sidebands) sections. Chemical samples are introduced through a small hole in a spherical mirror in order for the pulsed molecular beam to be coaxial with the microwave pulse. Experimental rotational parameters of the three chemical species will be presented along with a description of the spectrometer.